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December 1954

LISTS OF PUBLICATIONS AND PATENTS
OF THE
SOUTHERN UTILIZATION RESEARCH BRANCH
JANUARY - JUNE 1954

Agricultural Research Service

UNITED STATES DEPARTMENT OF AGRICULTURE

United States Department of Agriculture
Agricultural Research Service

LIST OF PUBLICATIONS AND PATENTS OF THE

SOUTHERN UTILIZATION RESEARCH BRANCH

January - June 1954

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Naval Stores Station, Olustee, Fla.

Citrus Products Laboratory, Winter Haven, Fla.

Food Fermentation Laboratory, Raleigh, N. C.

Fruit and Vegetable Products Laboratory, Weslaco, Texas

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New Orleans 19, Louisiana

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No.

COTTON

Fiber and fundamental investigations

*1 Brown, H. M, Contractor: Clemson Agricultural College, Clemson, S.C.
CORRELATION OF YARN STRENGTH WITH FIBER STRENGTH MEASURED AT DIFFERENT GAGE LENGTHS. Textile Res. Jour. 24(3): 251-260. 1954.

An improved technique for flat-bundle tests of cotton fiber strength has been developed. It has been established that spacing the jaws of the tester 2 to 4 millimeters apart -- instead of touching, as generally practiced -- gives a more correct ranking of cottons in terms of the yarns to be spun from them. This finding indicates that some cottons now being rejected as weak on the basis of conventional flat-bundle strength tests would actually spin into satisfactory yarns. This subject was studied because many investigators question the use of the conventional so-called zero gage length used in the Pressley Tester. Data are reported on 105 cottons. Fiber strengths were measured with the Clemson Flat Bundle Tester at 0, 2, 4, 6, and 8 mm. gage length and were correlated with the strength of yarns spun from the same cottons.

2 DeGruy, I. V., and Rollins, M. L.
THE MICROSCOPE AND THE COTTON MILL. Textile Indus. 118(6): 144-153. 1954.

Various microscopical techniques are used to investigate problems that arise in cotton textile mills. Fourteen photomicrographs show views of fibers depicting possible sources of spinning difficulties; number and maturity of fibers, their peripheral characteristics, airspaces; uniformity of fiber blends; neps and stains; effects of water, penetration of chemical treatments, or of molecular modification. Electron microscope views detail fine structure of cotton's primary wall; of untreated and mercerized fiber.

3 Hopper, T. H., and Tallant, J. D.
DEVIATIONS IN INSTRUMENTAL EVALUATION OF THE PHYSICAL PROPERTIES OF COTTON. Textile Res. Jour. 24(1): 53-57.

Increased use by mills and laboratories of the Fibrograph to measure length, of the Pressley Tester to measure strength, and the Micronaire to measure fineness of fibers, has indicated a need to maintain uniform levels of testing within a laboratory and between laboratories throughout the country. The sample-testing program was sponsored by

* References marked with the asterisk are reports of work done by outside agencies under contract with the U. S. Department of Agriculture, supervised by the Southern Utilization Research Branch.

No.

Committee D-13 of the American Society for Testing Materials during 1951 and 1952. (See item No. 4, this List, AIC-319, Supplement No. 3, July-December 1952.)

4 Hopper, T. H.
MILL LABORATORIES SHOW CLOSE AGREEMENT IN COTTON-FIBER TESTING.
Textile World 104(2): 131, 210, 212. 1954.

Mills obtain almost identical results in laboratory tests of physical properties of cotton fibers. Tests made by the same laboratory with the same operators agree more closely than tests made by different laboratories. Fiber length was tested with the Fibrograph, strength with the Pressley Tester, and fineness with the Micronaire. Smaller differences would probably have been found if all laboratories had followed specific instructions for each test, maintained standard conditions in the testing rooms, and tested standard cottons of known properties.

5 Orr, R. S., Weiss, L. C., Humphreys, G. C., Mares, T., and Grant, J. N.
DEGRADATION OF COTTON FIBERS AND YARNS BY HEAT AND MOISTURE.
Textile Res. Jour. 24(5): 399-406. 1954.

Strength and elongation of cotton fibers were correlated with yarn properties after heating the fibers and yarns from 2 to 128 hours in an oven at 110°, 138°, and 162° C. in air representing relative humidities from 3% up to saturation. Losses in yarn and fiber strengths are closely related; fiber and yarn strength and elongation are reduced by heat at the higher temperatures, regardless of the moisture present; but for the least amount of degradation, moisture should be either very low or high enough to exclude air (at saturation point). A simultaneous reduction of strength and elongation of fibers indicates that degradation occurs through creating or intensifying weak points along the fiber -- an indication confirmed through viscosity determinations.

6 Reeves, R. E.
2,5-DIMETHYL-D-GLUCOFURANOSE AND TWO NEW CRYSTALLINE DERIVATIVES.
Amer. Chem. Soc. Jour. 76(3): 934. 1954.

In research to develop flame-retardant treatments of cotton by reaction with titanium compounds one of the model glucosides used was methyl 2,5-dimethyl-a-D-glucofuranoside. Two new crystalline derivatives of this glucoside are 2,5-dimethyl-alpha-D-glucofuranoside, and methyl 2,5-dimethyl-3,6-diacetyl-alpha-D-glucofuranoside. Upon hydrolysis of the methyl glucoside the reducing sugar, 2,5-dimethyl-D-glucofuranose, was obtained in solution, but it could not be prepared in crystalline form. Some of its properties have been determined.

No.

7 Rollins, M. L., and Tripp, V. W.
OPTICAL AND ELECTRON MICROSCOPIC STUDIES OF COTTON FIBER STRUCTURE. Textile Res. Jour. 24(4): 345-357. 1954.

Photomicrographs and electron micrographs illustrate both gross and fine features of the cell wall morphology. Methods for isolation of components of the cell wall have permitted observations with the light as well as the electron microscope. The first layer of secondary thickening, called the "winding layer," has been isolated from 17-day old cotton fibers and photographed with both microscopes.

8 Rollins, M. L.
SOME ASPECTS OF MICROSCOPY IN CELLULOSE RESEARCH. Analyt. Chem. 26(4): 718-724. 1954.

Light microscopy has been an accessory tool to electron microscopy in studies of cotton cellulose. The need to prepare extremely thin sections of cotton fiber for electron microscopy led to development of methods for isolation of individual components of cell wall. Polarized light has been used to gain information on refractive index, degree of birefringence, angle of crystallite orientation. Other microscopical techniques described include ultraviolet, infrared, and phase microscopy. Results with cotton fibers using both electron and light microscopes are given. Quantitative measurements of shrinkage in cotton's primary wall (isolated by special technique) confirm its restrictive influence on fiber swelling. There is evidence that the location and orientation of the cellulosic "winding layer" accounts for its nonreactivity in certain substitution treatments.

9 Segal, L., Loeb, L., and Creely, J. J.
AN X-RAY STUDY OF THE DECOMPOSITION PRODUCT OF THE ETHYLAMINE-CELLULOSE COMPLEX. Jour. Polymer Sci. 13(69): 193-206. 1954.

The decomposition product of the ethylamine-cellulose complex has been obtained by immersion of cotton fiber in liquid ethylamine and evaporation to dryness. X-ray diffraction patterns of the decomposition product indicate that the crystalline modification present is cellulose III. This formation of cellulose III apparently requires that a critical percentage of the cellulose I lattice be first transformed into the ethylamine-cellulose complex. The delayed appearance of the cellulose III pattern is explained by the slow formation of the ethylamine-cellulose complex within the crystallite, this arising from the compact crystal structure of cellulose I. The appearance and retention of the 020 interference was noted and an attempt made to explain the phenomenon.

No.

Mechanical processing

10, 11, 12 Fiori, L. A., Brown, J. J., and Sands, J. E.
EFFECT OF SINGLE AND PLY TWISTS ON THE PROPERTIES OF A 31/2 CARDED COTTON YARN. Textile Res. Jour. 24(3): 267-272. 1954.

EFFECT OF SINGLE AND PLY TWISTS ON THE PROPERTIES OF A 15.5/2 CARDED COTTON YARN. Textile Res. Jour. 24(5): 428-433. 1954.

EFFECT OF SINGLE AND PLY TWISTS ON THE PROPERTIES OF 31/2 AND 15.5/2 CARDED COTTON YARNS. Textile Res. Jour. 24(6): 526-534. 1954.

High twist multipliers in the ply yarns and low twist in the single yarns give 2-ply yarns with the greatest strength and elongation at the same time. Cotton manufacturers can apply this information to judge whether changes in their twist combinations would produce 2-ply yarns of better quality at lower cost. Deltapine cotton, a variety of average fiber properties, was spun into carded yarns using two yarn numbers: 31/1 and 15.5/1, both Z twists. Twist multipliers ranged from 2.9 to 6.9 in making single yarns of both yarn counts. These single yarns were used in making 2-ply yarns (31/2 and 15.5/2, both S twist) with twist multipliers ranging from 1.9 to 7.9. Results show that maximum values for strength and elongation of 2-ply yarns are not obtainable simultaneously -- they must be compromised.

13 Fiori, L. A., Brown, J. J., and Sands, J. E.
EFFECT OF COTTON FIBER STRENGTH ON SINGLE YARN PROPERTIES AND ON PROCESSING BEHAVIOR. Textile Res. Jour. 24(6): 503-507. 1954.

Hopi Acala 50, with fiber strength of 96,000 p.s.i. and a variety of medium strength, 80,000 p.s.i., having other important fiber properties approximately equal, were processed alike on conventional equipment into 12/1, 22/1, 36/1, and 50/1 yarn numbers. Twist multipliers ranged from 2.75 to 6.75, in increments of one. Skein and single-strand strength data were plotted on semi-logarithmic paper to show proportional rates of change in yarn strength for a given yarn number. The strength of the fiber had little or no effect on processing efficiency through spinning; as expected, fiber of high strength produced stronger yarns than fibers of low strength for any given yarn number or twist; the amount of twist required to obtain maximum strength in single cotton yarns was not affected by fiber strength; nor was significantly the uniformity of products (slivers, rovings, single yarns), nor the yarn elongation.

No.

14 Pettit, G. A.
TRY THIS APRON SPLICING JIG. Textile Indus. 118(3): 138. 1954.

A simple, easy-to-use, small jig makes a smooth, even, and pliable splice when replacing leather aprons on long-draft spinning frames -- by holding the apron ends in alignment and applying pressure to the glued area while splicing the apron directly on the frame. The jig is readily adjusted preparatory to making the splice and quickly detached afterwards.

15 Rusca, R. A.
DEVELOPMENTS IN EUROPEAN COTTON PROCESSING METHODS.
Textile Res. Jour. 24(6): 589-591. 1954.

European processing methods and machines are basically the same as ours. The labor situation is different. Research in textile machinery seems concerned largely with developing new equipment, or modifying cotton machinery, specifically to process synthetic fibers. Opening rooms are more complicated than average American opening rooms. One development on drawing frames is a new type of fluted roll which, combined with a slight tension draft in the middle drafting zone, reportedly produces a more uniform drawing sliver. Uniformity is improved also by using a 3-over-4 arrangement on draw frames and combers. Some mills are changing to sliver lappers and 16-ends up bicoil drawing frames to eliminate one process of drawing or roving. Use of pneumatic and hydraulic systems in top-roll weighting is increasing.

16 Rusca, R. A., and Pettit, G. A.
THE RETRACTO-PIN CONTINUOUS CARD STRIPPER. Textile Res. Jour. 24(6): 539-540. Also in Textile World 104(4): 80 (Title: New Continuous Stripper May Cut Card Waste 1%); and in Textile Indus. 118(4): 181-182 (Title: Retracto-Pin Continuous Card Stripper). 1954.

Because commercially available continuous card strippers would not be satisfactory for stripping the card when it is unusually heavily loaded, a new type of stripper has been developed. Promising as a practical aid to the textile industry in processing raw cotton, it is still an experimental device, and test results are preliminary and incomplete. A small rotor traverses and strips the card cylinder of impacted fibers through a slot in back plate. Small-diameter pins or wires remove impacted cotton from the card clothing, and a combination of mechanical forces and self-generated air currents return these strips to the surface of the cylinder. The rotor is driven directly from the card by means of spinning frame tapes, and the slot in the back plate is sealed by a sliding metal strip.

No.

Chemical processing

17 Buras, E. M. Jr., Cooper, A. S., Keating, E. J., and Goldthwait, C.F.
PRACTICAL PARTIAL ACETYLATION OF COTTON. Amer. Dyestuff Rptr.
43(7): 203-208. 1954.

Practical processes for the partial acetylation of cotton, well adapted for commercial use, have been worked out. The process converts cotton into a new type of textile fiber with several new or improved properties. Several commercial developments are based on these processes. Fabric can be acetylated on stainless steel dye jigs, as used in cotton finishing plants, or on a newly developed continuous range; yarns, in package form or continuously as warp; raw stock, in a raw stock dyeing machine. The processes employ acetic acid and anhydride, with small amounts of perchloric acid as catalyst. Data on the concentration of chemicals used, duration of treatments, temperature, and other conditions required for best results have been determined.

*18 Compton, J., and Hart, W. J. Contractor: Institute of Textile
Technology THE THEORY OF SOIL-FIBER COMPLEX FORMATION AND
STABILITY. (Letter to the Editor.) Textile Res. Jour.
24(3): 263-264. 1954.

Theories concerning the mechanisms of soil deposition and retention on fiber surfaces that have resulted from work during the past 4 years are summarized. Factors governing the rate and probability of the formation of a soil-fiber complex, and the nature of the bond between soil particles and the fiber surface, or factors controlling the stability of the soil-fiber complex are considered. There are three possible binding mechanisms for a soil-fabric complex: Macroocclusion (entrapment of particles in the intrayarn and interyarn spaces); microocclusion (entrapment of particles in the irregularities of the fiber surfaces); and sorptive bonding of the soil to the fiber (by van der Waals' or coulombic forces). The importance of micro-occlusion as a factor has been hitherto neglected. The stablility of the soil-fabric complex (basic problem of detergency) depends on the nature of the bonding mechanism or mechanisms. The process of drying -- called "secondary deposition" -- greatly increases binding of soil to fiber by one or more of the modes mentioned.

19 Daul, G. C., Reid, J. D., and Reinhardt, R. M.
CATION-EXCHANGE MATERIALS FROM COTTON AND POLYVINYL PHOSPHATE.
Indus. and Engin. Chem. 46(5): 1042-1045. 1954.

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Phosphorylated cotton is a new, chemically modified cotton fabric that has promising ion-exchange capacity. A special method of phosphorylation of cotton is described which greatly increases the degree of phosphorylation. A polyhydric alcohol is first phosphorylated and the cotton is then treated with the product. Four times as much phosphorus can be fixed on cotton, with equivalent strength loss, as with the usual urea-phosphate treatment of cotton. A cation-exchanger is produced that compares favorably with commercial cation-exchangers.

*20 Fourt, L., Howorth, R. M., and Rutherford, M. B. Contractor: Harris Research Laboratories, Washington, D. C. IMPROVEMENT OF LUSTER OF COTTON. PART III: CORRELATION OF VISUAL AND PHYSICAL ASPECTS OF LUSTER. Textile Res. Jour. 24(1): 61-66. 1954.

Comparisons made of measurements of luster with visual judgments confirm that transparency, and scattering from the deep layers of the material, are important and have measurable effects on luster. Luster depends on sheerness of the fabric, as well as on the weave pattern. Light has less opportunity to be scattered within thin layers than in its return from the lower parts of thick layers of yarn. The measurement of contrast ratio in yarns correlates with the average judgment by observers. As for fabrics, the ability of the eye to see sparkle or high lights, and to find the angle of maximum reflection, gives visual judgment some features not possessed by the more simple types of physical measurement, although there is a large degree of correlation.

*21 Fourt, L., and Rutherford, M. B. Contractor: Harris Research Laboratories, Washington, D. C. IMPROVEMENT OF LUSTER OF COTTON. PART IV: EFFECT OF WEAVING PATTERN ON LUSTER IN A SERIES OF BLEACHED COTTON FABRICS. Textile Res. Jour. 24(1): 67-72. 1954.

Luster of cotton fabrics can be influenced by fabric design. Effect of weaving pattern on luster in a series of bleached cotton fabrics, manufactured at this Laboratory from the same cotton and processed similarly, in which the pattern varied from plain weave to 4/1 twill, and in number of ends and picks and in yarn fineness, has been investigated by reflectance measurements and by visual ratings. Weaving pattern influences luster through its effects on the length of a given set of yarns lying on the surface, the degree of curvature or straightness of each set, and the number of interruptions by the crosswise set. The longer and straighter the surface floats of the set of yarns which parallels the line of view, the higher the luster. Decreasing texture and cover, using the same yarns, increases luster. In general, sheer or thready fabrics have higher luster than fabrics made with the

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same yarns at higher texture or cover. Coarser yarns decrease luster; finer yarns increase it. Thus, if both texture and yarn size are changed, keeping cover constant, the effect on luster is the result of two opposing tendencies, and the changes are smaller than would result from variation in only one factor. Visual judgment of luster generally shows fair correlation with the indications of the contrast ratio.

*22 Fourt, L., Howorth, R. M., Rutherford, M. B., and Streicher, P.
Contractor: Harris Research Laboratories, Washington, D. C.
IMPROVEMENT OF LUSTER OF COTTON. PART V: FIBER SHAPE IN RELATION TO LUSTER. Textile Res. Jour. 24(2): 156-163. 1954.

Fiber shape in relation to luster has been investigated since many of the differences between lustrous cotton fabrics and other lustrous textiles are due to the unique shape of the natural cotton fiber (a flattened, twisted-ribbon structure), which is retained to some degree even after mercerization. The data indicate that the shift of the peak of reflection or the absence of a peak in reflection from cotton yarns and fabrics can be explained by the increased effectiveness of small surfaces acting as mirrors at glancing angles. Mercerizing improves the roundness of cotton, and thus reduces the scattering due to tiny planes, aiding in concentrating light near the mirror angle. Sheerness also increases the appearance of luster, by decreasing scattering from depth, and a similar effect is produced by dyeing to darker shades. When the reflection from fabrics is corrected for the change of effectiveness of reflection with angle, the effects of weaving structure are indicated as not one but three peaks of reflection.

*23 Fourt, L., Howorth, R. M., Rutherford, M. B., and Streicher, P.
Contractor: Harris Research Laboratories, Washington, D. C.
IMPROVEMENT OF LUSTER OF COTTON. PART VI: YARN STRUCTURE IN RELATION TO LUSTER. Textile Res. Jour. 24(2): 163-172. 1954.

Interrelations of fiber properties and luster have been studied in yarns representing many types of cotton. Results show that the three main means of improving luster by yarn structure factors are: lowering of twist; use of optimum plying twist; singeing to remove free surface fibers. The basic features of staple yarn structure which can vary in cotton yarns include those which depend on fiber factors such as fiber fineness, maturity, and staple length. In comparison with mercerizing, which increases the contrast ratio by 0.7 to 0.8 unit or more in commercial plied yarn, effects are smaller, but are still important because of the interaction between structure effects and the results of mercerizing.

No.

*24 Fourt, L., Howorth, R. M., Rutherford, M. B., and Streicher, P. Contractor: Harris Research Laboratories, Washington, D. C. THE IMPROVEMENT OF LUSTER OF COTTON. PART VII: FIBER PROPERTIES AND VARIETY CHARACTERISTICS IN RELATION TO LUSTER. Textile Res. Jour. 24(3): 279-291. 1954.

The entire range of American cotton production has been examined for correlation of luster with other fiber properties over 2 crop years. Luster of cotton is shown to be a varietal characteristic, although also influenced by environment of growth. The Section of Cotton and other Fiber Crops Section of the Field Crops Research Branch of ARS has cooperated. The strongest correlations are of higher luster with greater length, greater strength, and greater roundness. American-Egyptian types, experimental triple hybrids, and Hopi-Acala 50 differ in the relation of fiber properties to luster. The main Upland group, whether raingrown or irrigated, or long-staple, shows a uniform general trend of relationships. Trends remain generally the same after mercerizing; the most lustrous cottons in the natural state tending to gain most on mercerizing.

25 Fourt, L., and Sookne, A. M. Contractor: Harris Research Laboratories, Washington, D. C. BETTER MERCERIZING FOR IMPROVED LUSTER. Amer. Assoc. Textile Chemists and Colorists Proc. Amer. Dyestuff Reptr. 43(10): 304-309. 1954.

Factors that affect the luster of cotton are reviewed. The mercerizing treatment is the principal means of improvement. Other principal factors are variety of cotton chosen; and singeing which can exert an effect about half as great as that of mercerization. Additional small factors that contribute are the twist and yarn number. In fabrics, the weave pattern with the longest floats produces the highest luster. The sheerest fabrics are also most lustrous to the eye and in instrumental measurements. The development of tools for measuring luster permits the "tuning up" of the mercerization process in an individual mill.

26 Guthrie, J. D., Chance, L. H., and Hoffpauir, C. L. PROCESS FOR PRODUCING TEXTILE CELLULOSE SULFO-ETHYL ETHER CATION-EXCHANGE MATERIAL. U. S. Patent No. 2,681,846. June 22, 1954.

A process has been patented for producing this cellulosic cation-exchange material: 2-sulfoethylated cellulosic textiles. Cellulosic textiles are impregnated with mercerizing lye solutions containing 2-chloroethane-sulfonic acid, ethionic acid, or ethylenesulfonic acid and then are cured.

No.

27 Hamalainen, C.
PROCESS FOR FLAMEPROOFING TEXTILES WITH POLY-PHOSPHONITRILIC ESTER. U. S. Patent No. 2,681,295. June 15, 1954.

A process for producing flameproofed textiles has been patented which is based on use of polyphosphonitrilic ester. Cotton textiles are impregnated with the esters produced by reacting a polyhalopropanol containing at least two atoms of the group bromine and chlorine with a mixture of phosphonitrilic chlorides in the presence of pyridine.

28 Reeves, W. A. and Guthrie, J. D.
FLAMEPROOFED FIBERS AMINOALKYLATED CELLULOSE DERIVATIVES. U. S. Patent No. 2,668,096. February 2, 1954.

A process of producing flameproof cellulosic textiles containing a flammability reducing agent which is chemically bonded to the cellulose has been patented. Aminoalkylating cellulosic materials are impregnated with an aqueous solution or dispersion of tetrakis (hydroxymethyl) phosphonium chloride (THPC) or a product of partially reacting THPC with a nitrogen compound such as melamine, guanidine, urea, or a methylol derivative of it; or either THPC or the product made by partly reacting THPC with a nitrogen compound along with formaldehyde; then heating the impregnated materials at from about 80° to 160°C., until the aminoaklylated cellulose reacts.

29 Schuyten, H. A., Weaver, J. W., and Reid, J. D.
SOME THEORETICAL ASPECTS OF THE FLAMEPROOFING OF CELLULOSE. Advances in Chemistry, Series No. 9, "Fire Retardant Paints": 7-20. June 1954.

Several theories of thermal decomposition of treated and untreated cellulose, the latter also involving burning, which others have proposed to explain how flaming is inhibited in the many processes used to flameproof cloth or cellulosic materials, are considered. The study leads to the conclusion that dehydration aided by accelerated gas production through a Lewis acid-base interaction by way of a carbonium ion or carbanion mechanism, explains the behavior of all known flameproofing agents. Much of the reasoning involved in this theory should apply also to the flameproofing of wood.

OILSEEDS AND OTHER OIL-BEARING MATERIALS

Properties and composition

30 Bickford, W. G., Pack, F. C., Castillon, L. E. and Mack, C. H.
THE ANTIOXIDANT AND ANTIPOLYMERIZATION PROPERTIES OF GOSSYPOL, DIANILINOGOSSYPOL, AND RELATED MATERIALS. Amer. Oil Chem. Soc. Jour. 31(3): 91-93. 1954.

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A potential availability of about 40,000 tons annually of gossypol makes gossypol an attractive raw material for research. So gossypol and related materials have been evaluated for their antioxidant and antipolymerization properties. Gossypol was superior as an antioxidant; and the related material, dianilinogossypol, was the most effective as an antipolymerization agent. Antioxidant substrates were cottonseed oil and lard. Styrene, vinyl acetate, and methyl acrylate were the vinyl-type monomers chosen for antipolymerization tests. Monomers protected with gossypol or the related materials are highly colored -- a fact limiting their outlets. It is realized that the toxicological properties of certain materials tested are unestablished. However, the concentrations at which gossypol is effective are below reported deleterious physiological levels.

31 Kinman, M. L., and Stark, S. M., Jr.
YIELD AND CHEMICAL COMPOSITION OF SESAME, SESAMUM INDICUM L., AS AFFECTED BY VARIETY AND LOCATION GROWN. Amer. Oil Chem. Soc. Jour. 31(3): 104-108. 1954.

The effect of variety and location on chemical composition of the sesame seed, and of the interrelations of those chemical measurements of seed components which determine economic value of sesame as an oilseed crop, was investigated in 24 varieties of sesame grown at 23 locations in 16 states. Chemical composition was markedly influenced both by the varieties and by location. Sesame seems reasonably well adapted to the better soils of most of the Southern half of the United States. Average seed yield for varieties of 14 locations was 506 pounds per acre. Average yield per acre of seed 644 pounds, of oil 344 pounds, and of protein 163 pounds, for 7 varieties grown at 8 locations. Average oil and protein contents (moisture-free basis) were 53.53% and 26.25%, respectively. Average iodine value of oil was 110.0. Average protein content on the oil free, as well as moisture-free, basis was 57.28%. Genetic and environmental influences that affected protein content also inversely affected oil content. Results suggest that protein synthesis is favored over oil synthesis as the nitrogen supply to the seed increases.

32 O'Connor, R. T., Von Der Haar, P., Dupre', E. F., Brown, L. E., and Pominski, C. H.
THE INFRARED SPECTRA OF GOSSYPOL. Amer. Chem. Soc. Jour. 76(9): 2368-2373. 1954.

Gossypol creates problems in processing cottonseed (because it lowers quality of the meal and when extracted with the oil is responsible for color reversion). Spectrophotometric studies to correlate infrared spectra with chemical groupings in the

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molecules of gossypol and its derivatives have provided a basis for following by infrared absorption the changes occurring in these materials. Infrared spectra of chloroform solutions of gossypol, of 13 derivatives and degradation products of gossypol, and 18 "model" compounds containing groupings present in the gossypol molecule, have been obtained in the region from 2 to 12 m.u. The data confirm that gossypol is an aromatic and phenolic compound; that a carbonyl ortho to a hydroxyl group is present; that in some derivatives there are no carbonyl groups; that in others carbonyl groups are attached directly to an alicyclic grouping.

33 Skau, E. L., and Blucher, R. E.
AN INTERPOLATIVE METHOD OF CALCULATING SOLUBILITIES OF MISSING MEMBERS OF HOMOLOGOUS SERIES. Jour. Phys. Chem. 58(6): 460-468. 1954.

An equation relating the solubilities of homologous long-chain organic compounds to the number of carbon atoms in the molecule has been developed. It provides a method for determining solubilities for missing members of the series by a graphical correlation of published solubility data; it can be used to smooth out experimental solubility data; and to locate discrepancies caused by experimental error or by an impurity in one sample in the series. From the approximate freezing point lowering equation and the known empirical relationships between the number of carbon atoms, n, and the heats and entropies of fusion of the members of a homologous series is derived this linear equation: $\log N = a + bn$, in which N is the solubility of the homologs (expressed in mole fraction) in a given solvent at a given temperature and a and b are constants depending upon the temperature and the system involved. Log N vs. n isotherms have been plotted for 125 systems involving ten homologous series in 16 different solvents using published data and results have been tabulated.

34 Stansbury, M. F., Cucullu, A. F., and Den Hartog, D. T.
COTTONSEED CONTENTS VARIATION: INFLUENCE OF VARIETY AND ENVIRONMENT ON OIL CONTENT OF COTTONSEED KERNELS. Agric. and Food Chem. 2(13): 692-696. 1954.

Analysis of variance indicated that both variety and environment have a highly significant influence on the oil content. Oil contents of moisture-free cottonseed kernels from seed of 8 commercial varieties of cotton grown at 13 locations during 3 years ranged from 26.8 to 43.4%. Rainfall influenced oil content significantly even with temperature constant; maximum temperature significantly influenced oil content with rainfall held constant. Although rainfall and maximum temperature during the maturation

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period are important causes of variation in the oil content, much of the environmental variation in oil content is also due to other factors not considered in the study. There was no statistically significant difference in the response of any of the varieties to variations in temperature and rainfall.

Processing

35 Gastrock, E. A.
SEAL A VACUUM SOLVENT SYSTEM WITH THE SOLVENT. ("Plant Engineering Memo".) Indus. and Engin. Chem. 46(3): 124A. 1954.

In connection with pilot-plant solvent-extraction of oilseeds was found a novel solution to the problem of using vacuum in systems involving volatile and flammable solvents. Solvent is used as the sealing liquid with centrifugal vaccum pumps. The scheme is being used commercially in a plant for filtration-extraction of cottonseed recently put into operation by Mississippi Cottonseed Products Co., Greenwood.

36 Gastrock, E. A.
WHEN SHOULD COTTONSEED OIL MILLS CONVERT? Cotton Trade Jour. Internatl. Yearbook, 1953-1954 Ed. 34(12): 36, 37, 38, 210. 1954.

Provided proper local situation exists, conversion from hydraulic pressing to filtration-extraction (see Lists, AIC-319, Supplement 1, item 39; Supplement 2, item 30; Supplement 3, items 26, 27, 29) can be considered even for an 80-ton-per-day plant operating 150 days per year or over or for larger installations. Conversion from screw pressing to filtration-extraction can be considered for an 80-ton-per-day plant, especially if operating for 200 or 250 days per year. For the 150- and 200-ton-per-day plants the reasons for converting to filtration-extraction are stronger. Pay-out times for conversion from screw pressing are slightly longer than for conversion from hydraulic pressing, the differences varying from 0.9 to 2.7 years. Article gives 4 tables of data to show comparative operating costs for hydraulic-pressing, screw pressing, and solvent extraction; oil gains per ton of cottonseed crushed by conversion to filtration-extraction; annual gains and pay-out times for plants operating over seasons of different lengths.

Glyceridic oils and fatty acids

37 Boucher, R. E. and Skau, E. L.
PHASE RELATIONS PERTAINING TO THE SOLVENT WINTERIZATION OF CRUDE PEANUT OIL IN 85-15 ACETONE-HEXANE MIXTURE. Amer. Oil Chem. Soc. Jour. 31(6): 268-270. 1954.

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A process for winterizing crude peanut oil can be visualized which would involve mixing the proper proportions of the concentrated crude hexane miscella and acetone to make up a winterizable mixture of 35% by weight of oil in an 85-15 acetone-hexane mixture. Performing the winterization step before refining, bleaching, and deodorizing would result in a fully winterized salad oil and eliminate readdition of solvent and restripping. For more satisfactory crystals lower oil-solvent ratios at lower temperatures are required than for refined peanut oil. From a practical point of view, the winterization can best be carried out on a 35% oil solution in the acetone-hexane mixture at -12°C. with a 1-hour holding time.

38 Dollear, F. G.
WHAT CAN CHEMICAL RESEARCH DO FOR TUNG OIL? Amer. Tung Oil Assoc. Ann. Proc. 1953: 62-66. 1954.

Tung oil offers possibilities for combination with many other chemical compounds to form new materials of potential value. The conjugated unsaturation of tung oil renders it reactive with organic compounds such as butadiene, quinones, maleic anhydride, acrolein, cyclopentadiene, and dimethyl cyclopentadiene, through a Diels-Alder type reaction. The ester group of the glyceride molecule allows ester interchange reactions with other alcohols, acids, or esters. For example, tung oil might be combined with glycols, starch, cellulose, fatty acids from other oils. Some research has been done on these types of compounds. Data on properties, reactions during heat bodying, methods of chemical modification of tung oil would be quickly applied by industry to the development of new products. Promising outlets for tung oil derivatives are in plastics and plasticizers and biologically active chemicals.

39 Freeman, A. F.
RESEARCH IN THE BUREAU OF AGRICULTURAL AND INDUSTRIAL CHEMISTRY ON UTILIZATION OF TUNG. Amer. Tung Oil Assoc. Ann. Proc. 1953: 52-55. 1954.

Current and future research by this Laboratory on the utilization of tung is reviewed. Decreased use of tung oil for manufacture of protective coatings has forced emphasis on chemistry of the fatty acids as an approach towards developing new uses in the oil -- their beneficial properties, etc., but research will be done also to determine a materials balance in mill operations, and on production of tung press cake suitable for use as a feed. Work to date has established the chemical structures of the alpha- and beta-eleostearic acids (about 75-80% of tung oil). Various chemical modifications of tung oil have been made and are

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being tested. Progress has been made in preparing mercury derivatives of eleostearic acid, and the usefulness of such compounds is to be tested. Improvements in processing have resulted from previous research, and analytical methods have been developed, including determinations of oil, moisture, eleostearic acids; total unsaturation.

40 Freeman, A. F., Morris, N. J., and Willich, R. K.
PEANUT BUTTER. AIC-370. 61 pages. Processed March 1954.

Sixteen scientific papers by members of SURB pertinent to the manufacture of peanut butter are reviewed, plus 82 publications by other investigators. Effects of roasting and other processing operations and effects of storage on the development of rancidity, thiamin content, and extent of oil separation were studied through production of butters on pilot-plant equipment, followed by chemical analyses and taste panel tests. Some methods for evaluating peanut butter and constituents were modified to give a better measurement; for instance, reflectance spectrophotometry was established as an objective measurement of the color of peanut butter. The nature of the stabilizing effect of hydrogenated peanut oil in peanut butter and composition of peanuts from different varieties as related to the stability of the derived oils were studied. Processes for the incorporation of vitamin A in peanut butter were evaluated; and an improved, continuous process was developed.

41 Holmes, R. L., Pack, F. C., Minor, J. C., and McKinney, R. S.
THE PHYSICAL AND CHEMICAL CHARACTERISTICS OF COMMERCIAL TUNG OILS. Amer. Tung Oil Assoc. Ann. Proc. 1953: 56-61. 1954.

Information on the variation in the physical and chemical characteristics of commercial tung oils has been sought to provide the industry with a means of evaluating effects of processing conditions on quality of oil, and perhaps enable improvement in quality by modification of methods of processing. Characteristics that depend upon the eleostearic acid content -- heat test; refractive index; dispersion; and hydrogen iodine value -- were investigated on 116 samples of tung oil (86 from domestic and 30 from foreign mills). Averages on 74 domestic screw-pressed are: total eleostearic acid, 78.7% (the alpha form 77.7%; and the beta form, 1.2%); refractive index at 25°C., 1.5174; acid value 1.0; heat test, 11.8 minutes; Wijs iodine number, 162.2; specific gravity 25°/25° C., 0.9364; viscosity, at 25°C., stokes 2.2 poises; unsaponifiable matter, 0.38%; volatile matter 0.07%; saponification value, 192.0.

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42 Holmes, R. L., and Pack, F. C.
THE EFFECT OF EXTENDED STORAGE ON THE PROPERTIES OF TUNG OIL. Amer. Oil Chem. Soc. Jour. 31(3): 96-98. 1954.

A controlled storage experiment was designed to gather data that would support or negate some generalizations that tung oil is difficult to store, and similar statements in the literature. Tung oil stored in clean, well-filled gallon containers at the end of 3 years still met A.S.T.M. specifications. Storage locale (indoor, outdoor, sheltered, or unsheltered containers) and the coating on containers were less important than protection of the stored oil from atmospheric oxygen. The most pronounced effect of prolonged storage on tung oil is a shortening of the heat test (gel time at 282°C.). Uncontaminated tung oil does not spontaneously isomerize during storage.

43 Lovegren, N. V., and Feuge, R. O.
FOOD COATINGS, PERMEABILITY OF ACETOSTEARIN PRODUCTS TO WATER VAPOR. Jour. Agric. and Food Chem. 2(11): 558-563. 1954.

One of the properties of acetostearin products that are being evaluated is permeability to moisture. A modification of the standard cup method was used and measurements were made at various temperatures and relative humidities using films of different compositions and thicknesses. Permeability constants calculated for the films were not independent of the thickness nor the concentration of water vapor. Permeability of acetostearin films to water vapor is less than that of cellulose acetate and slightly greater than that of nylon, ethylcellulose, and polystyrene. Cellophane and paraffin wax have significantly smaller permeabilities.

44 Magne, F. C., Skau, E. L., and Freeman, A. F.
SOLUBILITY OF HYDROGENATED PEANUT OIL IN PEANUT OIL. Amer. Oil Chem. Soc. Jour. 31(3): 113-114. 1954.

The principal process used to prevent the separation of peanut butter into an oil phase and a meal phase involves the uniform incorporation of small amounts of hydrogenated peanut oil. Solubility measurements have been made for a commercial hard peanut fat in a refined and bleached peanut oil. The nature as well as amount of solid crystals present in the oil is important; under controlled conditions any amount of the high-melting modification of the hard fat incorporated in peanut oil above the solubility temperature in excess of 2% should produce a mixture free from oil separation under average storage conditions.

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45 McKinney, R. S., and Holmes, R. L.
THE OIL CONTENT OF TUNG PRODUCTS BY A RAPID PETROLEUM NAPHTHA METHOD. Amer. Oil Chem. Soc. Jour. 31(5): 172-174. 1954.

The oil content of wet or dry tung fruit, press cake, and filter cake can be determined rapidly and accurately by use of an improved analytical method. Results are in good agreement with those obtained by 4-hour extraction with petroleum ether by the Official Method of the American Oil Chemists Society. In the new procedure, a finely ground sample of the tung material is mixed for 10 minutes in twice its weight of a high-boiling petroleum naptha. The solution of oil is filtered off, and its specific gravity determined. Oil content is estimated, either by reference to specific-gravity percentage tung oil tables or to curves prepared by the researchers.

46 Planck, R. W.
RICE RESEARCH AT THE SOUTHERN REGIONAL RESEARCH LABORATORY. The Rice Annual; Rice Jour. (June) 14-16, 18. 1954.

Subjects of recent publications on rice, reviewed in this article, include: Microorganisms associated with storage of freshly harvested rice; effect of heat on the viability of rice; drying of rough rice; moisture equilibria between rice and air; effect of changes in atmospheric humidity and temperature during milling of rice; studies of rice oil and wax; influence of variety and environment on chemical composition; studies of X-ray photography of kernels to identify the stage of processing in which damage occurs to kernels.

47 Vicknair, E. J., Singleton, W. S., and Feuge, R. O.
SOME PHYSICAL PROPERTIES OF THE POLYMORPHIC FORMS OF 1,2-DIACETO-3-STEARIN AND 1-ACETO-3-STEARIN. Jour. Phys. Chem. 58(1): 64-66. 1954.

It was discovered at this Laboratory that fatty products containing the triglyceride (1,2-diaceto-3-stearin) and the diglyceride (1-aceto-3-stearin) are nongreasy solids relatively highly plastic and stretchable. These products appear to have practical uses. The two glycerides were prepared, purified, and examined dilatometrically over the temperature range of -17 to 60°C. Expansibilities, melting dilations, and temperatures at which polymorphic transitions occurred were determined from the dilatometric curves obtained. X-ray data for all polymorphic forms of each glyceride were obtained and crystal spacings were calculated. Photomicrographs of two forms of each glyceride were made.

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48 Willich, R. K., Morris, N. J., and Freeman, A. F.
PEANUT BUTTER. V. THE EFFECT OF PROCESSING AND STORAGE OF PEANUT BUTTER ON THE STABILITIES OF THEIR OILS. Food Technol. 8(2): 101-104. 1954.

Effects of processing and storage on the autoxidative deterioration of peanut butters, as indicated by the stabilities of their oils, have been investigated. Butters were produced in a pilot plant at this Laboratory. No. 1 grade, shelled white Spanish peanuts, obtained from a shelling plant in southeastern United States, were roasted to various extents in 2-bag (250 lb.) batches in a natural gas-fired, radiant-heat roaster; were cooled, mechanically blanched, and manually sorted. Stabilities of oils extracted from freshly prepared butters, regardless of the extent of roasting, or presence or absence of additives, were quite high (average, 35 hours). After storage of the butters for 2 years (in the absence of light) stabilities of oils were still satisfactorily high, although reduced (average, about 23 hours). Neither the extent of roasting accorded the peanuts, nor the incorporation of salt, nor of salt with hydrogenated peanut oil, had much effect.

Meals and proteins

49 Altschul, A. M.
THE EFFECT OF PROCESSING CONDITIONS ON THE NUTRITIVE VALUE OF COTTONSEED MEAL FOR POULTRY - A REVIEW. Poultry Sci. 33(1): 180-185. 1954.

This article summarizes cooperative research underway to develop means of producing, economically and regularly, cottonseed meals that will be suitable for unrestricted use in poultry feeds. The program comprises laboratory research on the chemistry of cottonseed processing; development of a chemical measure of nutritive value; practical experiments in industrial mills; and cooperative experiments with nutrition investigators. Feeding tests show that screw-pressing can produce meals that are safe for unrestricted use in poultry feeds under such conditions that the temperature of the meats entering the press is 200°F. or less. Also, some prepress solvent-extracted meals produced in commercial mills not heated above 200°F. before pressing have free-gossypol contents of 0.03%.

50 Arthur, J. C., Jr.
PEANUT PROTEIN: ISOLATION, COMPOSITION, AND PROPERTIES. Advances in Protein Chemistry. Ed. by M. L. Anson, K. Bailey, and J. T. Edsall. Vol. VIII. Pages 393-414. 1953. Academic Press, Inc., New York, N.Y. 1953.

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This review cites 240 references from the world literature. Protein content of the nut or kernel is about 25%, which makes the peanut a significant source of vegetable protein for foods, feeds, and industrial products. Peanut protein consists of two principal fractions, arachin and conarachin. Very little information is available on chemical reactions of peanut protein. Nutritional value of peanut protein compares favorably with other vegetable proteins; but compared with animal proteins, is deficient in lysine and methionine. Fibers, glues, sizings, and other industrial products have been made experimentally from peanut protein.

51 Jensen, E. A. (fellow, NCPA) and Altschul, A. M.
RESEARCH ON COTTONSEED MEALS. (Ann. Rep. of fellow of
Natl. Cottonseed Products Assoc. at SRRL) Cotton Gin
and Oil Mills Press: 55(11): 16, 18, 50-51. 1954.

Most important result of an investigation of the effects of autoclaving on the nutritive and the chemical and physical properties of cottonseed meals was the indication of a strict parallelism between reductions in protein quality index and decreases in nitrogen solubility -- suggesting that individual components of the protein (amino acids) are altered in some way during processing, either by heat alone or by reaction with other meal constituents under the influence of heat. Time of autoclaving was the main cause of reductions of nutritional value of a standard meal (one of low gossypol content and high nutritive value, prepared by successive extractions with hexane and butanone). Next objective will be to establish methods for determining the amino acids content of cottonseed meals andmeal fractions, as a basis for relating changes in content to changes in nutritive value.

52 Mann, G. E., Hoffman, W. H., and Ambrose, A. M.
DETOXIFICATION AND TOXICOLOGICAL STUDIES ON TUNG MEAL.
Jour. Agric. and Food Chem. 2(5): 258-263. 1954.

Contents of protein and carbohydrates of tung meal indicate that it would be valuable as a feed for cattle -- if a reliable procedure could be developed to detoxify it completely on a large scale. Rats were fed tung press cake and meal, oil, and protein -- before and after treating the materials by procedures described in the literature for removing or inactivating toxic substances present in tung products. Results were correlated with variables involved in production of the tung products. Press cake obtained by a commercial screw-press process -- involving exposure to high heat -- became almost completely detoxified only after it was extracted with ethyl alcohol -- indicating the presence

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of a toxic component stable to heat, as reported by other investigators, but extractable by ethyl alcohol. A hexane-extracted meal could not be detoxified completely by a combination of autoclaving and extraction with ethyl alcohol.

53 Thurber, F. H.
LABORATORY EXPERIMENTS ON COOKING OF COTTONSEED TO PRODUCE IMPROVED MEAL AND OIL. Oil Mill Gazetteer 59(2): 72-74. 1954.

Experiments are underway to find a means of either removing gossypol from cottonseed meal, or inactivating it, during processing, without lowering the nutritive value of the protein by excessive heating or by any other means. In one study a meal of low gossypol content, prepared by extraction of oil with hexane followed by extraction of gossypol with methyl ethyl ketone, had an exceptionally high protein efficiency, determined in chick feeding studies. This meal serves as a standard in determining the nutritive value of other cottonseed meals. Other studies deal with effects of moisture, temperature, and time on cottonseed flakes in a closed cooker without agitation, and effects of chemicals, particularly acids and alkalis, on the meats during cooking.

Bibliographical

54 Baringer, K. L., Ed. by
SRRL PUBLICATIONS ON PEANUTS, 1942-1953. Facts from Research on Utilization. AIC-369. Processed. 45 pages. March 1954.

This abstract bibliography covers 92 publications, mainly by members of this Laboratory, reporting facts about peanuts accumulated in eleven years of utilization research -- relating to composition, properties, reactions, technology, storage, and almost every phase of the processing of peanuts -- kernels, oil, meal, protein, hulls, and peanut butter. Abstracts are arranged according to date of publication in these categories: Literature surveys and reviews; general; kernels; storage; oil; meal; protein; hulls (work by Eastern Utilization Branch); and peanut butter.

MISCELLANEOUS

55 Fisher, C. H., and Persell, R. M.
THE NEED FOR AGRICULTURAL RESEARCH IN THE SOUTH AND SOUTHWEST. The Cotton Gin and Oil Mill Press. 1954.

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Research will be the basis for any sound, long-range program for agriculture, and will be keynoted by cooperation among universities, industry, government research groups, and trade and commodity associations. Expectations from research; the rapid growth of industrial research as a major influence in industrial development; the story of agricultural research; the revolutionary progress of agriculture in the last 75 years in the United States; the effect of research in creating need for greater knowledge to solve new problems; the need for "balance" in agricultural research; the problem of agricultural surpluses; this country's need to adjust to world-wide changes in economic and social conditions; and research to discover entirely novel operations are main topics discussed.

56 Fisher, C. H., and Persell, R. M.
FOOD PROCESSING RESEARCH ON SOUTHERN FARM CROPS.
South. Food Processor. Ann. Rev. No. 1954

Progress is being made in solving some important processing problems of the South through research on citrus fruits; cucumbers, sweetpotatoes, beets, tomatoes, black-eyed peas; rice, cottonseed, peanuts; and sugar cane.

57 Reeves, R. E., and Mazzeno, L. W., Jr.
THE REARRANGEMENT OF ACETYLATED AND BENZOYLATED BETA-GLUCOSIDES CATALYZED BY TITANIUM TETRACHLORIDE.
Am. Chem. Soc. Jour. 76(8): 2219-2221. 1954.

The action of titanium tetrachloride in transforming glucoside benzoates provides a convenient method of preparing the alpha-glucosides from their anomers. Titanium tetrachloride catalyzes the formation of an equilibrium mixture of benzoylated nonaromatic glucosides in which the alpha-isomer greatly predominates over the beta-isomer. The transformation of the benzoylated beta-glucosides occurs more readily than that of the corresponding acetates. Six new crystalline glucoside derivatives and a crystalline compound containing o-nitrophenol, titanium and chlorine in the ratio 2:1:2 have been prepared.

58 Reeves, R. E., and Mazzeno, L. W., Jr.
THE COMPOSITION OF SOME TETRA-t-BUTYL TITANATE-GLYCOL REACTION PRODUCTS. Amer. Chem. Soc. Jour. 76(5): 2533-2536. 1954.

Further information on the titanate-glycol and titanate-polymer structures has been obtained by means of cryoscopic measurements in highly purified t-butyl alcohol solution employing the particular titanate, tetra-t-butyl titanate.

The reaction of this titanate with three simple glycols and with ethyl acetoacetate has been investigated. The formation of a compound having the titanate: glycol ratio of 2:3 is indicated; the species formed may contain 4 moles of titanate and 6 of glycol. The formation of other compounds having the compositions 2:2, 2:4, and 3:6 is also suggested. It appears that this titanate does not form simple chelates with one or two bidentate glycol residues attached to a central titanium atom. On the other hand, the titanate appears to react with ethyl acetoacetate to form 1:1 and 1:2 compounds.

SUGARCANE AND DERIVED PRODUCTS

Confectionery

59 Anonymous.
PEANUT BRITTLE RANCIDITY. AIC-368, 4 pages. Processed by the Natl. Confectioners' Assoc. January 1954. Candy Res. Summ. No. 2.

This Candy Research Summary presents conclusions reached in experiments being sponsored jointly by USDA and the National Confectioners' Association. Peanut brittle to which dairy butter has been added is the product studied. Antioxidants in the sugar part of the candy do not prevent rancidity in the peanuts. Peanut oil in peanut brittle becomes rancid after storage of peanut brittle only 2-1/2 months at room temperature. This booklet tells how the development of rancidity can be minimized by use of fresh peanuts; use Runner peanuts.

60 Martin, L. F., Mack, C. H., and Fahs, F. J.
PROGRESS IN CANDY RESEARCH. Rept. No. 28. Processed by Natl. Confectioners' Assoc. 20 pages. June 1, 1954.

Progress is being made in experiments underway in cooperation with the National Confectioners' Association. Formulation of starch jellies with high-conversion corn sirup has improved texture and keeping quality. Invert sugar as a replacement for part of the granulated sugar and regular corn sirup of the usual starch gum formula produced less tender jellies. Pure dairy butter fat has been hydrogenated to various degrees, yielding fats ranging in melting points from 81° to 118°F. These are being evaluated by a manufacturer to determine maximum amounts that might be used as a replacement for cocoa butter. Natural strawberry essence is now available commercially. Further tests of dried Brewer's yeast as an antioxidant in butter creams containing 10% dairy butter have shown that incorporation of 3% of yeast on the total batch weight is adequate to stabilize the higher concentrations of butter fat in these candies: Fudge and chewy caramel, as well as additional butter creams, were made according to formulas and procedures submitted by the Quartermaster.

Composition

61 Roberts, E. J., and Martin, L. F.
IDENTIFICATION AND DETERMINATION OF NONNITROGENOUS ORGANIC ACIDS OF SUGARCANE BY PARTITION CHROMATOGRAPHY. Anal. Chem. 26(5): 815-818. 1954.

Application of partition chromatography on silicic acid columns of large capacity has effected the separation of nine non-nitrogenous acids from sugarcane juice. Acids hitherto undetected -- mesaconic, fumaric, and succinic acids -- have been isolated and identified, and more satisfactory confirmation of the malic, oxalic, citric, and glycollic acids has been obtained. Previously, only aconitic acid, the predominant compound of this class, has been studied extensively. The method of Marvel and Rands employing their small standard columns has also provided a tool for studying effects of the variety of cane, conditions of its growth, maturity, and other factors on composition and quality of juice for recovery of sugar.

Processing

62 Fort, C. A., Smith, B. A., and Martin, L. F.
COMPARISON OF THE EFFECTIVENESS OF SELECTED ION-EXCHANGE RESINS FOR THE PURIFICATION OF CLARIFIED SUGARCANE JUICE. Third Technical Session on Bone Char. Proc. (1953): 179-198. 1954.

Properties and capacities of anion-exchangers of the salt-splitting type, and three cation exchange resins for removing ionic impurities and color from sugarcane juice have been determined individually, in experiments on the purification of reconstituted juice which had been evaporated to sirup density for storage, as well as by a combination of the selected anion- and cation exchangers, followed by treatment by weakly basic or decolorizing resins for neutralization and color removal. Results obtained by means of reverse cycle purification were compared with those obtained by treatment of the same natural and synthetic model juices with a strong anion-exchanger followed by a strong cation-exchanger, and also with the results of conventional demineralization using a strong - cation-exchanger first, followed by a weakly basic anion-exchanger.

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*63 Schaffer, F. C., Goodell, E. R., Stewart, C. W., and Keller, A. G. Contractor: Louisiana State University, Baton Rouge, La.
EVALUATION OF SUGAR CANE VARIETIES. A STUDY OF MILLING CHARACTERISTICS. PART I. Summary of Results - For Seasons 1950 and 1951. Harlan, D., Kunberger, A., and Stewart, C. W. PART II. Summary of Results - 1952. Engin. Expt. Sta. Bull. No. 42. Dept. Chem. Engin. Louisiana State Univ. 1954.

Determination of milling qualities of a sugarcane variety before it is released for commercial planting can help eliminate canes that might later cause processing difficulties in mills. This advance evaluation of manufacturing qualities can best be obtained by grinding, experimentally, small lots (several tons) of the cane, but under conditions simulating commercial practice, and then processing the juice. Milling tests were conducted on certain unreleased and commercial varieties of cane, using the facilities and staff of the Audubon Sugar Factory of Louisians State University, during the 1950-51, 1951-52 and 1952-53 seasons. In these reports data are tabulated including average mill results on all tests made; and comparative rating of processing characteristics of the varieties processed each season. Bagasse densities are given for the 1952 season. CP44-155 was promising for good factory performance in all three seasons. Because of the limited number of tests possible on the new varieties, the results should not be considered conclusive.

FRUITS AND VEGETABLES

Citrus

64 Bissett, O. W., Veldhuis, M. K., and Scott, W. C.
LIME JUICE SUPERCONCENTRATES. Food Engin. 26(6): 56-57, 190, 193-194. 1954.

Procedures for processing lime juice superconcentrates from which limeade of true flavor can be prepared have been developed and pilot-plant-tested. Greatest advantage is saving in space, and this without loss in flavor in comparison with limeade prepared from fresh juice. The products are an 8-fold, sweetened concentrate, requiring only water for reconstitution, and 35-fold unsweetened concentrate needing addition of sugar and water. Oil content, soluble solids-acid ratio, and concentration can be held as desired, making uniform products possible. Equipment required is on hand in plants. Since fresh limes are available in Florida in largest

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quantities in late summer and fall when orange processing equipment is normally idle, production of these limeade concentrates would extend the season.

65 Bissett, O. W., Veldhuis, M. K., and Rushing, N. B.
PASTEURIZATION AND STORAGE OF SWEETENED AND UNSWEETENED LIME JUICE. Food Technol. 8(3): 136-138. 1954.

Experiments have shown that during production of canned lime juice sufficient heat treatment to inactivate pectinesterase enzymes and destroy bacteria is desirable, and that refrigerated storage of the canned juice favors retention of highest quality in the juice. Sweetened and unsweetened lime juices have been heated to temperatures ranging from 120°F. to 200°, canned, cooled, and tested for stability in storage at 35°. Effects of the different heat treatments were judged on the basis of bacterial counts, flavor, destruction of pectinesterase enzyme, and cloud stability. Heat of 150° reduced microorganisms to a low level, but 170° was required to destroy pectinesterase and insure cloud stability in 35° storage. Refrigerated heated products retain flavor practically unchanged for 15 months, but some changes occurred in unheated samples. At 80° all samples deteriorated rapidly.

66 Griffiths, F. P., Lime, B. J., and Stephens, T. S.
NOTES ON THE PROCESSING CHARACTERISTICS OF LIMES. Eighth Ann. Rio Grande Valley Hortic. Inst. Proc. (January): 110-113. 1954.

Experiments in which Mexican limes of the same type as those grown heretofore in the Lower Rio Grande Valley, known as West Indian, Key, or Mexican Limes, were processed have shown that a satisfactory limeade base for freezing can be made from Mexican limes if careful extraction procedures are used. Addition of sugar to 60° - 65° Brix gives a base which upon dilution with 5 volumes of water yields a limeade containing approximately 0.75 gram acid per 100 ml. and 12-14% sugar.

67 Huskins, C. W., and Kew, T. J.
NOTES ON FACTORS ASSOCIATED WITH GELATION IN FROZEN CONCENTRATED ORANGE JUICE. Fla. State Hortic. Soc. Proc. 66: 254-258. November 1953.

To gain a better understanding of the causes involved in the gelation of commercial frozen orange concentrate when stored at temperatures above 0°F., the relation between pectinesterase activity and pectin content in commercial frozen orange concentrates has been studied. Samples of orange concentrate obtained from 4 citrus-processing plants during

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the 1950-51 canning season and from 6 plants at the beginning and end of the 1951-52 season were analyzed. The limited data indicate that stability to gelation is related to the pectinesterase activity; as it increases, tendency towards gelation increases.

68 Rushing, N. B., Patrick, R., and Veldhuis, M. K.
EFFECT OF CONCENTRATION OF ORANGE JUICE AND TEMPERATURE OF STORAGE ON GROWTH AND SURVIVAL OF MICROORGANISMS. Fla. State Hortic. Soc. Proc. 66: 281-286. November 1953.

Samples of concentrated orange juices of 40° to 70° Brix, in 5° steps were stored at 35°, 50°, and 60°F. for 168 days and examined periodically. No cans of concentrated juice of 50° Brix or higher swelled in 35° storage, but at 50° and 60°F. swells were observed at all concentrations below 70° Brix. Yeasts were the main spoilage agents, except for 40° Brix samples stored at 50°F., where high counts of slime and gum-forming bacteria were also found in swelled cans. Coliforms were found in 40° through 65° Brix juices when prepared, but after 6-day storage they were found only in 40°, 45°, and 50° Brix concentrates at 35°F.; and 40° and 45° Brix concentrates at 50°F.; after 14-day storage, none were found.

Cucumbers

69 Peterson, W. J., Bell, T. A., Etchells, J. L., and Smart, W. W. G., Jr.
A PROCEDURE FOR DEMONSTRATING THE PRESENCE OF CAROTENOID PIGMENTS IN YEASTS. Jour. Bact. 67(6): 708-713. 1954.

The presence of carotenoid pigments is used in yeast taxonomy to distinguish the genus Rhodotorula from Cryptococcus and Torulopsis genera. Yeast species grown in a synthetic broth for 72 hours on a rotary shaker readily yield pigments from the centrifuged cells by extraction with cold acetone only. The pigments are then transferred to petroleum ether for characterization by chromatographic and spectrophotometric methods. This simple, rapid procedure is aiding in research on yeast species isolated from the flowers of the cucumber plant.

PINE GUM AND DERIVED PRODUCTS

Properties and composition

70 Baldwin, D. E., Loeblich, V. M., and Lawrence, R. V.
CHROMATOGRAPHIC SEPARATION OF ACID OBTAINED FROM OXIDATION OF ALPHA-PINENE. Analyt. Chem. 26(4): 760-762. 1954.

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Partition chromatography has been modified for use in studying the acids present in pine gum and its derivatives. Improvements in the separation and identification of the monocarboxylic acids (especially pionic) was obtained on columns employing benzene and benzene-1-butanol as the developing solvents. This method has been successfully applied to the analysis of crude samples of pinic acid (prepared in a pilot-plant by oxidation of commercial alpha-pinene with potassium permanganate to pinonic acid followed by the oxidation of pinonic acid with a deficiency of calcium hypochlorite to pinic acid).

71 Stinson, J. S., and Lawrence, R. V.
THERMAL ISOMERIZATION OF GUM ROSIN. Indus. and Engin. Chem. 46(4): 784-787. 1954.

The effect of temperature on physical and chemical properties of gum rosin is an important problem. A study has been conducted which should permit a more accurate prediction of changes likely to occur during processing. Since the industrial utilization of rosin generally requires it to be processed at temperatures between 225° and 290°C., effects of temperatures in this range for time intervals up to 8 hours were studied. As rosin is sometimes temporarily stored by manufacturers around 155°C., one run was included at this temperature. Changes fell into two categories: Moderate heating for short periods of time brought about an increase in softening point, a more negative optical rotation, a slight decrease in acid number, and an increase in the tendency of rosin to crystallize; either higher temperatures or prolonged heating at moderate temperatures caused an opposite trend in most of these changes.

REPUBLICATIONS

Reeves, W. A., and Guthrie, J. D.
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